

# The Mining Journal,

## RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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[GRATIS.]

## Original Correspondence.

## THE BLAENAVON IRON AND COAL COMPANY.

BY DAVID MURPHY, ESQ.

SIR,—I beg to offer the further remarks I promised on the position of this company. *Ex uno disce omnes* may be said generally of joint-stock companies, which have now flourished sufficiently during thirty years to make them matter of history. The causes of their almost invariable failure may be so clearly traced, that there is little difficulty in finding a common reason for their common disasters. The first striking feature to be perceived in the unsuccessful joint-stocks is, that they are framed in the London money market. Those bubbles, which never possessed anything but the promises of the promoters, soon, of course, burst, and are done with, leaving the cash transferred to those who intended that, and that only. But there is another sort, like the Blaenavon, which actually do acquire property with the funds the shareholders subscribe. One of the earliest of these was the Old British Iron Company, with the origin and progress of which I have been intimately acquainted. Relatives, who had more money than they rightly knew what to do with, were induced to be the first victims in this ill-advised affair, wilfully against sound advice, as also in Spanish bonds, Mexican gold mines, &c., led on by those City jobbers, who have certainly reached a sufficient degree of importance to be constituted into a separate corporation, "The worshipful Company of Sharps." Stocks at about par, in half a dozen years after the peace, people were looking out for better channels of investment, and eagerly let fly at any promise. Amongst other objects, the large fortunes that had been realised in the iron trade, by means and circumstances which were never taken into account, caught the eye of speculators. An engineer and his cousin, a solicitor, with a broker, of course, and a few more men at large, brought out a magnificent scheme for buying up all the spare waste iron concerns in the kingdom. How these were bought; how the promoters squandered the funds; how the manager of the purchases was expatriated, leaving his cousin to protect the skins of his colleagues by a tedious law-suit, in which, of course, he did not lose, respecting a matter which might have been settled at once, had the solicitor been acting solely for the shareholders, is but too well known to those who found themselves, when the game could be carried on no longer, minus a million and a half of money. In this company, as in the Blaenavon, born ten years later, and in many more, the same principle, or want of principle, may be traced in the original constitution. This kind of companies are not like the old canal or tramroad companies, formed of men who club their means together for a single definite object, take a share in the management according to their respective interests, and do their best to realise the intended advantages. By no means; they are simple creations of the London money craft, for the purpose of obtaining cash for themselves to expend. A solicitor and engineer, and some City men who are looking out for squalls, or have some special object in view (as, for instance, the iron merchants of the Blaenavon), prevail on a few social or thoughtless dummy friends to add their names to a prospectus, and the concern, promising a large interest for the capital subscribed, is ushered into the world. Under the sanction of such eminent names the money comes in. It is perfectly astonishing how men with a decent coat on their back will lend their names to what they know nothing about, as a bait for entrapping the public. But they will do it, that we see; besides baronets innumerable, had we not half a dozen barons, earls, and viscounts, in 1852, suddenly transmuted into professors of gold mining? Was not the ablest of the Secretaries to the Treasury a placard in one of these things, selling out his shares at a large premium? an act which, however common, is but periphrased larceny. An eminent merchant, statesman, or whatever he is, who delivers to his broker a quantity of shares he knows to be worthless, and employs him to palm them off at a premium upon small tradesmen, widows, clerks, clergymen, domestic servants, &c., is a worse thief than the sharper who leaves in payment of his furnished lodgings a portmanteau of sawdust and brick bats. But these are the 17 companies; the 501 companies, like the Blaenavon, are managed by the same people with more enduring objects. The money comes in, and there is a good heap to dig at; plenty of permanent posts are devised for relatives and dependents, of which I know something, for at twenty years of age I had the offer of swallowing in one of these posts 700*l.* a year of the means squandered by folly, ignorance, and delusion. The promise to the subscribers of large dividends, the bait for their money, is a dead letter, as soon as the concern is launched. The only active principle of the management is to handle as much money as possible amongst themselves, therefore, when the original funds are exhausted in the appropriation, the shareholders are told that want of ready money at the outset is the only cause of no dividends; and borrowing in all its various forms begins, and is continued as long as there is any available security remaining. When the managerial clique can squeeze out nothing more, the thing is suffered to break down, and what property remains is sold for a trifle, generally to those who have already taken such good care of it and of themselves.

This Paul-like morality is, as we were told, no obstacle to "good society," so long as the actors keep well to windward of the Old Bailey. That the origin of all such mischief is in the original constitution of the companies may be clearly illustrated by the history of the Blaenavon. The prime movers were not men with a single, straightforward interest in success, as in the old fashioned companies referred to, with public and local objects. Nothing of the sort; the movers were a knot of City dealers, with perfectly different interests to the subscribers, who cared not a rap about the property, except as a decoy or a conduit, which led so much circulating medium to pass through their hands. Directors in London can find abundant uses for cash balances; and what with patronage, appointments, and numerous *et ceteras*, direct and collateral, the real business goes forward without the least reference to the *bona fide* interests which supplied the capital. Scattered over the country, the subscribers are mere ciphers for action or vigilant restraint, and this the managers calculate on. The subscriptions are paid out in the first instance, just as if funded stock were bought, expecting the 10, 15, or 20 per cent. promised dividend will come in of itself, with as little trouble as the interest is received on Consols. Such a misplaced confidence gives the directors a misplaced power. The very word director is a delusion and a snare, giving a fictitious importance to persons who ought to be merely the servants of the common interest: the Joint-Stock Act helps the delusion, by ordering that all persons acting so and so shall be styled "directors." The title assumes that the directors are the principal shareholders, holding, and continuing to hold, the largest interest, but nothing is more opposed to the common fact. Men float their money away to the keeping of such nominal directors as if they were buoyed by the absurd expectation that there was a magic in

the title, which would take better care of their money than they can do themselves. For the better imposture of dignity, the managers do not form a committee, as in old-fashioned times, but a board, as a shadow of greater power; and when it is necessary to keep the real proprietors at a greater and more humble distance, the directors constitute themselves a "court." Under this tacit but foolish subterfuge the directors by degrees swell up to an immense magnitude, and absorb and regard themselves as constituting the whole company.

A bizarre instance of the habit occurs in a burlesque letter in your Journal of Sept. 29, signed "A Well-Wisher to the Concern" (*i. e.*, of course, to the directors). He therein censures Messrs. Robins and Bate for moving as shareholders to remedy abuses, because they are mortgagees, receiving from the directors "their annual payments," of what? Why, of the shareholders' substance. This is like a pay-sergeant complaining that it is "indelicate" to overhaul him for cheating in the rations, because he pays the money. It is but the prevailing fashion for trustees to do what they like with what is not their own.

The yearly balance-sheets of the Blaenavon may, likewise, be taken as a fair sample of the management of joint-stock accounts. The persons who expend the money, and have the book-keeping all to themselves, are in a position to put any fence they please before dangerous places, and give the expenditure the best appearance: thousands upon thousands are constantly expended in improving something or other, and something or other is always occurring to prevent the advantages of the improvement from being realised. Year after year it is the accounts and not the concern which are managed; there is no authority to look into the facts; the auditors, creatures of the board, sit in London, and deal with papers, not with things; and when the yearly concoction exhibits to a room full of unconnected people no dividends, the subscribers are actually in better case than if they had one; for immediately there is an appearance of funds available for profit accruing from better prices, or any other cause, the money-mongers of directors seize the chance to propose forthwith a borrowing scheme. They are thinking only of what they understand—debentures, preference shares, &c., which they well know where to bestow, and, with the slang of their craft, recommend as the "safest investment in the kingdom." (See a rigmorale letter to Mr. Robins, 6th Nov., 1840.) To produce money from the property, which would have to be paid to, and not by, the subscribers, is, therefore, quite out of the question. The borrowing and the getting in debt is the real business, to which the property serves as a peg, and the proprietors the nine pins, to be bowled down and out at pleasure. Columns of figures placed so as to convey no real information, but to conceal all that ought to be known, fill one page of the report, and the other page is filled with fussy votes of thanks of ludicrous non-importance, to distract attention from progressive ruin; reminding one of the memorable words of Gen. Sir W. Napier, characterising the fine speeches showered, when the inconvenient surprise was over, upon the man who betrayed his friends, and fortunately broke down the first coalition Ministry—"They are like the compliments of undertakers over a dead body."

How is it possible that, under such a system, the Blaenavon or any other undertaking can keep out of difficulties? There are all sorts of persons to do everything but what the *bona fide* objects of the adventure require. This company was constituted with ten directors. Ten cooks to one dinner, ten hinge-posts to one gate, ten captains to a ship, and ten commanders-in-chief to an army. Do you believe that if these ten men had really credited the report of Mr. Ashwell, which made the purchase, that an average profit of 10 per cent., over good and bad times, could have certainly been derived by investing 30,000*l.* each in the concern, to work it honestly, that they would not have found the sum, in preference to benevolently "letting in the public" to participate such advantages? They knew better; that was not their game. Without risking themselves, they marshalled the public into buying for their special use a good substantial property, a capital borrowing block, a fountain providing iron for their private trade, and 100,000*l.* a year to cut and carve for their uses and their salaries. It will be found, on a strict investigation of the accounts, that the managers have taken more than twice 10 per cent. upon their actual holdings, at the par value of 50*l.* a share, and upon the depreciated value 100 per cent. would not cover their profits.

It is idleness to talk of there having been lax management only, when it is the managers who profit by the laxity. Just as well excuse Sir John Dean Paul's bank on the ground of "lax management." It is a great mistake to suppose that, in joint-stocks, all is loss and mismanagement: there is great gain and excellent management for the hoodwinking and mammon-friend-making few. People may naturally suppose that men who have been held up at a public meeting "as naughty boys, well whipped," and that by a friendly intercessor who wished to mediate, much more than by a whole enemy, must feel as averse to appearing again at the board in public as the subscribers are to ever again seeing them there. That they would desire to soothe the smart in private, and hide their eyes, smeared and red with the tears of castigation. But I do not think so: it is assuming too romantic a view of human modesty. The genus director is a bold animal. In the very first act of these joint-stock melodramas, the countenance of the director's name is exposed as the advertising placard: then follow 20 years of effrontery, sufficient to harden a sea-jolly, in perhaps 20 concerns, at home and abroad. These are a sort of men who, so long as they gain their objects and the money, cling with tenacity to disgrace; and the proprietors may be sure that, if they wish to be saved, they must save themselves by energy and action, and by no means rely on the goodness of a virtuous abdication. The position of the property is extremely critical, and requires their best attention.

During the 20 years of the existence of this company much less, I believe, than 6000*l.* yearly has been divided as the average of nominal profit. I say nominal, because the whole amount of debt now standing exceeds the whole aggregate of dividends. The whipped directors are, it seems, negotiating a new lease. By the Aberglavenny Leasing Act of last session, the renewed rent must be at least 10,000*l.* a year. The present rent is 4500*l.*, to increase by 500*l.* a year for every furnace exceeding nine put into blast. Of this rent, which care has been taken not to fill with furnaces, about 2000*l.* a year is met by the sub-letting of the Nant-y-Glo section; so that, for the grievously wasted period of directorial doings, the Blaenavon victims have had the benefit of the low rental of 2500*l.* By the excellent management of the board, it appears that this substantial under-tenancy is to be lost to the company, who will, therefore, enter on their new term with an addition of about 8000*l.* a year to their present liabilities. Happy tenants of a new period of existence, by which their rent will exceed by 2000*l.* a year at least the average of directorial profits. This real state of the case was made consciously evident by the persuasive lenitives which the earl's agent administered to the last meeting, in a detail of the great prospects of advantage which, as a compensation, the amiable subscribers were to derive from selling coal and sub-letting collieries. That was the way, he said, Sir John Guest made his fortune. What a stimulus to a room full of incipient Guests! But all these clouds of coal dust and grateful incense can blind no man of sense to the real prospect. At present, all these fine things are in that tense peculiarly

belonging to joint-stocks—the *longo-post-futurum*. Were anything doing to realise them, it might be a different matter. The earl, as the meeting was distinctly told, is under a contract to re-let: where, then, is the hurry of throwing away 13 years of a low rental—10 years of it will be worth 80,000*l.*, and I am sure, whatever the directors think, the company is not in a position to throw away 80,000*l.* Instead of talking of the advantages to be realised at some nameless future from sales of coal, why not realise them at once, and test the value of the El Dorado before it is paid for? If it be the object of the board, as suggested by your correspondent, "The Rejected," to mismanage the property until they can buy the whole half-million for 50,000*l.*, it may be worth their while to give the earl a premium equal to 150,000*l.* above their purchase, as they will then pay merely the rental, and get the whole works and stock for nothing. But for men who have paid 500,000*l.*, and who have 200,000*l.* of debts yet to pay, to jump into 150,000*l.* more, without any preparation for it, and a downhill management under continuation, is plain insanity, if it can be avoided. Why not sublet the collieries at once, and get this great store of money in to pay off existing debts, before incurring new ones? Ten years' honest management might do a great deal; and I presume the existing contract is as binding for a new lease then as now. Knock off the London board altogether: it is the dead weight of the company. I notice that they contrived to pass a resolution that no sales of iron should be made, except in London. What was that for? An able agent in London, to conduct sales for the benefit of the proprietors, is all that reason requires. A couple of the principal holders resident in London (I suppose they must have the unfortunate name of directors) might be paid for consulting with him on special emergencies, when he required it; but the salesman must be the responsible person. Divided responsibility is a split bristle. The whole of the vast expense paid directors for mischievous attendances will be got rid of; for the costs of the London office will come out of what is now the private profit of the selling directors, who sell both the iron and the company. I believe there is already a very good manager at the works, if he were let alone, and who knows how to take advice, and where to ask for it, if suffered to act upon it. Two or three men of sense and business, whose interests are in the concern, on the spot, and not in London or Belgium, will form the country board to support him. But, at all events, whoever he be, an able, competent manager at the works, clothed with full authority, is the *sine qua non* to success; and he must, therefore, have such a salary as will induce a first-rate man to devote himself to the shareholders' interest. A joint-stock can hardly pay too much for a "right man in the right place." For gentlemen in London, walking in and out of a room, to manage a manufacture 150 miles distant, far too much has been paid already. Where the interest is so subdivided, it is impossible to make the management precisely like a private iron-works; but make it as much as possible unlike a joint-stock company. The two or three residents near the works, *quasi* directors, are not likely to have their chief interest in the concern (though they ought to have), and may, therefore, be paid like London directors for their attendances at the works, not at a table, one or more of them every week. Let them form part of a committee, to meet on the spot monthly at least, and which all shareholders who please can openly attend. All will be open and above-board—no delicate negotiations pending, too delicate for a proprietor's ear, and wrapped in mystery until sudden ruin bursts upon his shoulders. Quarterly meetings can be held for more special business; and when the yearly or half-yearly meeting is held in London, or wherever may suit the body of proprietors, a balance-sheet drawn, not by a friend, but by an independent public accountant, will give them some notion of their position. The cost of such an auditor will be money saved.

In fact, the wonderfully efficient audit which has been going forward of the Blaenavon accounts is a rare instance of the ruinous looseness of the joint-stock system. Once a year, or once a half-year, the performers, ranged behind a long table, which serves as a fortification against the inroads of common sense, produce a piece of paper, with the expenditure, not showing what has been done for the money, but merely how much money has been done for. The proprietors in the trenches take it all upon trust; they conclude their officers and their auditors have done their duty; they have no means to verify anything; they can take the sums total of the debtor and creditor columns, just as they might run up a strange butcher's bill, to see that the first rule of arithmetic had been properly applied, without the least inkling of the correctness of the items; and then the meeting passes the accounts. Upon what sort of an audit this "passing" is founded, see the exposures in the report of the committee of investigation.

And here I would make a remark on the apparent facility and frankness with which directors assent to this sort of committees, when they can no longer resist their appointment. A virtue is made of the necessity, and they have the wit to obtain credit for the ready access which they give to documents, and all kinds of information. They know what they are doing: the worse the character of the report, when it appears, the better for them. They rely upon the difficulty of bringing scattered shareholders into any kind of efficient united action against any amount of directorial delinquency: they have no fear of such a *rara avis* as a shareholder who would take the trouble to institute those criminal proceedings to which they know themselves to be liable. They are in possession of the property, and what they calculate on is, that the more disreputable the matters are which a report exposes, the more certain is it that the most respectable holders will be alarmed at the connection, and sell out for whatever they can get, to wash their hands, and escape what, at these periods, the managers always rattle very loudly—the danger of being involved in Chancery proceedings. They thus adroitly render a committee, which goes to work with a real good intention of improving the property, merely a tool for their main purpose of throwing the shares on the market at a depreciated value. In the Blaenavon, this jobbing has been carried on with a very high hand, the directors having actually refused to register any purchase of shares, they themselves being the only permitted purchasers.

It seems that they rely for this course upon a clause in their Deed of Settlement, which gives them the option of approving or disapproving a purchaser of shares. Such a clause would be interpreted in a court as intended to protect the property of the company, not the personal misdeeds of the managers against the property of the company; and I have not the least doubt that, if "The Rejected," and the numerous other persons whose purchases have been thus refused, would unite with the vendors in criminal proceedings, they would obtain redress. The directors would be forced to show good reason why they injured the property of any subscriber, by hindering him in the sale of it. It is a damaging act, which the law will not permit upon light grounds, much less when conducted on a system amounting to combination between the board and secretary to refuse and make valueless all shares, unless sold to themselves. In some of the cases related before the meeting, the directors had not

\* It is very gratifying to see the position lately assumed by the Duke of Marlborough in one of these things.

\* I have known such anonymous letters as this published merely as a manoeuvre to bring purchasers into personal contact with directors, for canvassing purposes. It is quite possible, so much intrigue is there in joint-stocks, that this very letter has been written by a director, with that object.



\* Member of the following societies:—The Imperial and Royal Society, Vienna; Society of Arts, Paris; Statistical Society, Paris; Geological Society, Paris; Geographical Society, Paris.



## LITERARY NOTICES.

*A Battle with the Basalts: being an Attempt to Deliver the Chief or Primary Crystalline Masses from Plutonic Dominion.* By JOSEPH HOLDSWORTH, Esq., M.G.S.F., &c.—London: Mining Journal office, 26, Fleet-street; Groombridge and Sons.—Edinburgh: W. Elgin and Son; Johnstone and Hunter.—Dublin: John Robertson.

It is with much pleasure we have to announce to our readers the appearance of a very interesting little publication, under the piquant and appropriate title of *A Battle with the Basalts*, by our old and able correspondent, Joseph Holdsworth, Esq., and which, in a less extended form, occupied several columns of the *Mining Journal* a short time ago. The author's long and extensive acquaintance with geological phenomena, his almost enthusiastic habits of close and accurate observation in the field, and, as we before have had occasion to observe, that lucidity of style and argumentative power which always mark his writings, are all elements which peculiarly qualify him for the task he has undertaken, and which a careful perusal of the pages before us, we imagine, can hardly fail to convince that he has, to the prescribed extent, forcibly and effectively performed. The more prominent and novel feature in Mr. Holdsworth's views, immediately bearing on the great geological problem (the solution of which has of late especially engaged the attention of practical and scientific men), consists in his demonstrating that the trappean rocks are not a molten product, but, in their characteristic varieties, have resulted from transmutation, as capriciously and irregularly effected at remote periods on certain of the heterogeneous materials existing in "the submarine, deep, humid recesses of the earth's great laboratory." This position he very amply illustrates and establishes on the several appearances presented by the interpositions of igneous and aqueous deposits, their passages into each other by insensible gradations, their occasional exhibition in distinctive compartments in the same identical mass of rock, thus singularly attesting the capricious character of the chemical-crystalline agencies to which it has been subjected, &c.; and, moreover, describes and points to the spots or localities where these various phenomena are to be seen *in situ*, so that "he who runs may read." The author then enters into an instructive variety of practical and scientific details bearing on the igneous question, treating of active and extinct volcanoes, earthquakes, thermal waters, crystalline lodes, remarkable veins, porphyritic dykes, composition and structure of rock, &c., and so elaborately and effectively investing the basaltic citadel (that stronghold of the Plutonists), that for ourselves we are free to confess our faith in a little shaken in its boasted impregnability. The book is, however, written in a spirit of candour and moderation, and an obvious desire earnestly to represent "things as they are" towards the elucidation of the great natural truths which constitute the main objects of the enquiry; in short, it altogether does much credit both to the head and heart of the writer, and we cordially recommend its instructive pages to the earnest perusal of our readers.

*A Manual of Electricity, including Galvanism, Magnetism, Diamagnetism, Electro-Dynamics, Magneto-Electricity, and the Electric Telegraph.* By HENRY M. NOAD, Ph.D., F.C.S. Part I. Electricity and Galvanism.—London: George Knight and Co., Foster-lane, 1855.

Although the present century has been most remarkable for the diffusion of general information, and for vast discoveries in all the agencies by which Nature effects her great and mysterious operations, electricity and magnetism have of late years progressed with more gigantic strides, and every succeeding principle eliminated has opened up more numerous fields for research than can be found in any other among the whole range of the inductive sciences. Among the many writers on these attractive and fascinating subjects, whose records of their experience we have had occasion to notice in our columns, those of the author of the work under notice, on the publication of three former editions of a similar one, have occupied our fullest attention. In the volume before us, although of greater bulk than the entire editions of the former works, it is found to be a full and complete treatise on the subject, and the principal electric telegraphs. The first chapter introduces the study of static, or frictional electricity, with the opinions and observations of the ancient philosophers, and the progress of the science up to the commencement of the present century; followed in nine more chapters, extending over upwards of 500 pages, by a popular investigation into the details of the various phenomena as they are at present understood. Each lecture is conveniently divided into sectional paragraphs, greatly facilitating reference. Modern discoveries, well-known facts, and all the minutiae of the science which practical experience has developed, are laid before the reader, illustrated by some hundreds of well executed diagrams, and full instruction in the simplest means of performing those practical experiments so necessary for correct elucidation. Taken as a whole, the work (when completed) will, if we may judge from the present volume, prove unexceptionable, forming, from the simple accuracy of its details, a first-rate work for elementary study; while the highly philosophical character of the information it imparts as to the present knowledge and commercial utility of the sciences on which it treats, renders it worthy a place in the library of every public institution, and we have no doubt it will be equally deservedly patronised by the scientific and enquiring community.

*The Elements of Practical Hydraulics: for the use of Students in Engineering.* By SAMUEL DOWNING, M.A., Professor of Civil Engineering in the University of Dublin.—London: Longman, Brown, Green, and Longmans, Paternoster-row, 1855.

This volume, as we are informed in the preface, was originally compiled as a text book for the engineering students in Trinity College, Dublin; its utility and correctness having, however, become apparent, it was found desirable to publish it for general information among students and engineers in that particular branch of their profession relating to practical hydraulics. The introductory chapters of the work are to a certain extent a translation of the well-known work of D'Aubuisson on hydraulics, which, although complex, is considered a standard work of value by engineers. The following portion, relating to the flow of water in artificial channels, rivers, and pipes, is based upon the formula for uniform motion of fluids in general use among English engineers, and far superior in the facilities it offers for calculation; and, indeed, the more complex formula is far from having obtained the confidence of foreign engineers themselves. The volume is well got up, and illustrated by well constructed diagrams.

*Leve des Adresses de l'Industrie Belge.*—JULES GERUZZI, rue de l'Ecluse, Brussels.

By means of documents furnished by the finance department, in virtue of a ministerial circular issued in March last, M. Geruzzi has been enabled to produce a very valuable compilation—the names and addresses of the whole of the manufacturers, usines, mining companies, and industrial establishments in Belgium—which is without doubt the most complete that has yet appeared. The information is not confined to any particular district, but comprises the entire kingdom. To manufacturers it will prove a long-wished for boon, as it will provide them with means of ascertaining the exact spot from which a raw material or any other requisite can be obtained. Being the only book of the kind, and extensively circulated at the Paris Exhibition, it has been a constant reference, and has thus answered the double purpose of affording information to those who required it, and of advertising the names of those who were less known in the commercial world, although, perhaps, equally entitled to patronage. The compiler proposes, in the event of the first edition being well received, to issue an enlarged and revised one. We think that there can be no doubt but that we shall soon have to announce the appearance of the second, as a work of such practical utility cannot fail to be appreciated by the public.

*PARSEY'S PATENT REVOLVING PUMP.*—There is nothing can be a greater boon to a certain class of eminent engineers at the present time than a perfectly good pump. Ordinary pump makers cannot supply what is so much required. Government contracts, drainage, emptying coffer dams, &c., water-works, sanitary improvements, and other important undertakings, from the imperfections of pumps and pumping engines, are obliged to be conducted with so much labour, excess of steam-power, and loss of time, and at an unavoidable excess of expenditure, that an improvement that shall take away mighty impediments and resistances created by the imperfection of the pumping machinery, and thereby relieve the working power of half its present duty, will be an advantage and economy worthy the consideration of Government contractors, engineers, sewer contractors, brewers, distillers, water companies, gas companies, agriculturalists, shipowners, &c. The valves, buckets, and packings of the common lift and force pumps are always out of condition, and great loss of time, inconvenience, and expense, constantly occur in replacing spare pumps for those that get deranged; and it has often occurred that the choking of a ship's pump, or its inefficiency, has been the cause of the loss of the lives of passengers, crew, ship and cargo. The principle of bucket pumps is imperfect, in having to ascend and descend, while the stream from them requires to be continuous. This reciprocating action of a force pump involves the hydrostatic action and reaction of the air which enters with the water, and fighting with its compressed power against the plunger and valves, congregates an accumulation of resisting forces, which are ever damaging the machinery, and demanding an excess of working power to overcome them, which ought, *de facto*, to be employed in effecting an easy and copious discharge. With these preliminary remarks, it must be observed that the desideratum of a perfect pump could only come from the accomplishment of circular mechanical motion. Disc engines and centrifugal pumps have given evidence of the greater ease and advantages of rotatory than of reciprocating motion, but have not proved adequate efficiency, as lift and force pumps are not applicable for general purposes, and have to be worked at extraordinary velocity, to get any duty out of them. The centrifugal pumps are good only for low lifts; as force pumps, for throwing water to considerable heights, they are of no use. In introducing the revolving pump and pumping engines, the merit, advantages, and economy of the invention depend upon the simplicity of the construction, the fewness of its parts, the impossibility of them getting out of place, the easy motion of its details, and consequent paucity of friction, mechanically fulfilling the mathematical problem of circular motion of a working shaft fixed eccentric in a cylinder. These pumps have no valves, leather, or packing. The sectional areas of the pump the dip net the discharge pipes require valves for lift pumps. For force pumps, the air vessel on the rising main only requires a valve. The pumps are constructed to do a full duty at 30 revolutions per minute, but as the circular motion produces no strain whatever on the details of the pump, the velocity and consequent discharge may be increased *ad libitum*. A pump 3 feet in diameter by 18 in. long, at 30 revolutions per minute will throw 72,000 gallons per hour, which will give an idea of the compactness and efficiency of the revolving pump. It is considered by experienced men that six men can throw as much water with one of these pumps as now takes 40 men, 20 a side, to work a frigate's chain pump. For fire-engines there can be no question that six or eight men could throw 139 gallons per minute, which is the quantity thrown by the fire brigade engine, which takes 30 men to work it. As all the parts of the revolving pump are metal, they are equally superior for hot or cold liquids, and will give special advantages to brewers, distillers, and others moving hot liquids. Anything of the size of the inlet pipe passes through them, in the absence of a screen or valve at the bottom of the dip pipe, with or without which these pumps will raise water from a well 28 ft., the whole height that the atmosphere will support a column of water. Specimens of these pumps, and one in action, may be seen at Mr. Parsey's depot, Great Scotland-yard. As the construction is so perfect in principle, the invention is equally efficient as a steam-engine, pump, exhaustor, or blower; and, in addition to the testimonials of other eminent engineers, a celebrated gas engineer testifies as follows:—"The simplicity of its action will recommend it for general purposes, there being no valves, as in the ordinary lifting and force pumps; therefore all liability of choking and disarrangement of valves and buckets is entirely removed, thereby rendering it a most simple and effective machine for raising and lifting water, or any other fluid; and through my long experience of 40 years I know of no other machine which is so simple, and so well adapted for the above purposes."

## IMPROVEMENTS IN THE STEAM-ENGINE.

The following statement has been drawn up by Mr. Craddock, in answer to an application, as to the precise advantages his inventions present, and the views he entertains respecting the formation of a company to carry them out:—

In answer to the application, it is desirable to give to my reply an obvious and brief form, so as to convey to others, in as few words as possible, what by my improvements I have really aimed at, and the importance of them. To do this, in the application of these improvements to marine purposes, we have only to consider that 1 lb. of coal produces more power, used as in the Cornish boiler and engine, than 3 lbs. of coal will produce, used as it is in the best marine boiler and engine; and as an instance of how much power can be obtained with little weight, we have in the best locomotive boilers and engines more power with a weight of 40 tons than with the marine boilers and engines, constructed and used as at present, we can obtain with a weight of 231 tons.

My improvements, then, have had for their object the combining of the economy of the Cornish boiler and engine with the lightness of the locomotive boiler and engine. In this I have been far more successful than years ago I even anticipated could be practically accomplished, and not only is this effected by these improvements, but every quality which has rendered the Cornish system so famed for economy is at the same time extended by my boilers and engines, beyond what is obtainable by the Cornish boiler and engine.

The risk to which life and property is exposed by all the boilers, of what ever kind, whether Cornish, locomotive, or by whatever name they may be known, which seek to retain steam and heated water, as in common use, by large circumferential surfaces, are by every day occurrences proved to be considerable, in spite of all that is said to the contrary.

My boilers go at once to the root of this evil, by removing the very cause from which these accidents arise—namely, the large mass of explosive matter, which in the boilers I have referred to is exerting its force upon their large circumferential surface, and substituting a small mass of explosive matter, which is held in check by very small circumferential surfaces, obtained by the strictly tubular character of my boilers, which I have now, by continued use and improvement in manufacturing and practical detail, placed beyond the power of even evil much longer to mislead the public, as to the interest it has in their general adoption.

The bare facts of the case, as to the advantages to be derived by the application of these improvements to marine purposes, are as follow:—

On the present system, a 500-horse engine, boiler, &c., is fairly represented by the following weights, and quantity of coal for a 14 days' voyage:

Weight of engine .....	Tons 105
Weight of boiler .....	78
Water in boiler .....	48
Coals for 14 days' steaming .....	887 = 618 tons.

On my plan, for a 500-horse engine, boiler, &c., (the various items would be:—

Weight of engine .....	Tons 76
Weight of boiler .....	86
Water in boiler .....	6
Coals for 14 days' steaming .....	129 = 247 tons.

From the foregoing tabular statement, we thus have 371 tons converted from unprofitable freightage into profitable freightage. I have made enquiries as to the present rate of freightage per ton, and find that, between Liverpool and New York, it is now by the first-class paddle-wheel steamers 6s. 6d. per ton; but 5s. 6d. per ton, for 14 days' steaming, will give 1855s. To this is to be added the saving of the cost of 258 tons of coal, which, at 1s. 1d. per ton, will give 358s.; so that, on the 14 days' steaming, the gain is 2113s. Supposing the vessel to steam in the year 224 days, the saving amounts to 33,808s. per annum. The cost of a 500-horse engine and boiler complete, on my principle, would not exceed 20,000s., the profit per annum upon this outlay therefore is 163 per cent. The amount of steam-power in use in the mercantile and naval steam-vessels of this country may be stated as equalling 200,000 horse-power: in such case, supposing my engines and boilers to substitute those at present in use, the saving per annum, if employed commercially, would be 13,523,200s.

I have referred to the locomotive and Cornish practice to illustrate two extremes, the one involving great bulk and weight, with great economy of fuel and wear of boilers, the other having little weight, but involving principles highly destructive of fuel, boiler, and engine, as all connected with the locomotive is driven at a railway speed. In the tabular statement given above, illustrative of my principles, I have adopted the Cornish plan of giving great evaporative and grate surface, with slow combustion, compared with the present marine practice; I have, therefore, for a given evaporation, given three times the quantity of grate and heat-absorbing surface, and yet, as will be seen, have greatly diminished the weight of the boiler. In these boilers of mine there is no salt water and no deposit, the steam is kept steady at any desired pressure, and that may be varied at pleasure and with safety from 50 lbs. to 200 lbs.—I say with safety, for my boilers are incomparably more safe with 200 lbs. than are the present marine boilers with 20 lbs.

A slight consideration of what has been stated will show that these improvements have more value for marine than for any other purpose, as the advantage arising from the conversion of unprofitable tonnage into profitable is greater than that arising from the saving of coal; but, for all purposes, the saving in the cost of fuel which these improvements will effect is very great. For saw-mills, they require no other fuel than the sawdust and refuse of the mill to produce the steam power required to drive it; the more fully employed the mill is, the more equal is such fuel to supply the steam required. These inventions are, and have been, in work for years; and, therefore, what I here state I at least can rely upon. I have made engines and boilers upon these principles varying in power from 5 to 100-horse, so that in regard to them there is no untested novelty or undeveloped idea. I have, therefore, the strongest evidence that advantages equivalent to 20,000,000s. sterling per annum, as insisted on by me, will be derived from their general adoption.

Here the question occurs to many persons—if these inventions are of so much national advantage, how is it that they have not long ago been adopted? This question is best answered by the consideration that these inventions, like those of Watt, are of an organic kind, and are thus distinguishable from the endless and minute alterations and improvements which are continually taking place in the mere matter of mechanical detail. It is only by a knowledge of what these inventions really are in this respect, and recollecting that, to understand the retarding influence against which I have had to contend, that it is necessary to consider that the complete organisation of skill and its accessories which maintains a manufacturer in a commanding position, is incalculably opposed to material changes of construction. This fact must be appreciated to estimate the full force which checks the reception of new and comprehensive inventions, as alterations of extent and magnitude must of necessity entail private loss in the public gain. It should also not be overlooked that the little knowledge most men possess, as to the practical bearing of such inventions, and the facility which in combination with this the natural prejudice affords to interested parties to control the purse-strings, and surround the inventor by an atmosphere of more than Popish obstructiveness and horrid, because private, persecution, it is in this way an individual is bound hand and foot, with no power but that of truth left him to scatter the doubts so artfully raised and assumingly fostered upon a subject so little understood even by engineers, and so unsuited to catch the popular feeling; yet to the well being of mankind, if it labours to live and not live to labour, few truths are of such vital importance to the very existence of millions of human beings.

*STEAM-BOILERS.*—Mr. D. Dunn, of King's-row, Pentonville, has patented the constructing steam-boilers in such a way that they may gradually revolve on an axis, very much after the fashion of a coffee-roasting machine, so that a fresh surface of the boiler may be constantly exposed to the action of the fire, instead of allowing the latter always to act on the same surface, as is usually the case. One of the ways of accomplishing this, and supposing an ordinary cylindrical boiler to be chosen for the purpose, the patentee bolts, rivets, or otherwise fastens at each of its ends an axis of a suitable length, supported on bearings in the usual way. One of these axes may be of solid iron, but it is preferred to be hollow, and provided with a stuffing-box, through which a water pipe passes, in order to feed the boiler with water, and it is also on this axis the patentee prefers placing a water gauge, to indicate the level of the water in the boiler. To this is fastened a cog-wheel, into the cogs of which an endless screw or spur-wheel is working, or else a pulley with a chain, by means of which a slow revolving motion is given to the boiler. The various means by which such a motion may be accomplished are well known to engineers. The other axis, fastened at the other end of the boiler, should be hollow, and through this hollow axis, and through a stuffing-box with which it is provided, a steam pipe passes, which is bent upwards, and always remains so inside the boiler; and it is by means of this steam-pipe, which is provided with a steam-cock placed at a suitable distance, that steam generated in the boiler finds an exit when wanted. The boiler is, therefore, revolving on two projecting ends or axes, one of which serves to support one end of the boiler, and it is to this end the patentee prefers attaching the cog-wheel or other apparatus by which the boiler is made to revolve; the other end is hollow, and revolves upon the horizontal portion of the pipe, by means of which the steam may be withdrawn from the boiler when wanted. On this pipe, and at a convenient distance from the boiler, the safety valve is placed.—*Civil Engineer and Architect's Journal.*

market; for if this had not been the stumbling-block with Mr. Cookshott in 1789, and with Mr. W. Crawshaw more than 20 years afterwards, the latter is not the man to have thrown away the profit on the total loss of the 24 years, being 1,255,900 tons. Besides, how could these 1,255,900 tons of puddled iron be brought to the most available profit, without first going through my father's grooved rollers, which increased the make of puddled and hammered bar-iron not merely double, but 20 for 1 in some time, with some number of hands, and of best quality, as compared with hammered bars, too inferior for exportation; whereas the export of puddled and rolled iron of all sorts, for more than half a century, has not been much less than 8,000,000 tons.

It may be seen by the reports of two select committees of the House of Commons, one dated June 12, 1829, and the other July 24, 1833, that 300,000s., out of many millions sterling, during the last half century, had been distributed from the national funds for the most absurd and unworthy objects, as well as for others really deserving national reward. Among the former sort, the following sums were thrown away: 14,000s. to the original inventor of Italian engines, invented 76 years before; 5000s. for making the ocean fresh and wholesome, but never brought to London in exchange for Thames water; 2500s. for bringing sprats and other fish to London; 500s. for making paste to supersede wheat flour. Among the gigantic national rewards, the greatest is 110,000s., for twenty years ending in the year 1813, besides a pension of 3000s. per annum for mail coaches—the latter being superseded by railways, at a cost of nearly 400,000,000s. of money, which would have cost 100,000,000s. more, but for my father's inventions, not rewarded by the Legislature with one farthing! In 1839, more than 1400 persons were recipients of pensions annually for all kind of services equal to 140,000s. annually, including the representatives of families who never saved the nation a single farthing; while two of the daughters of Henry Cort, who had saved then 200,000,000s. sterling, were the least of all the annuitants, lingering on miserable pensions of 19s. per annum each; while others were receiving hundreds and thousands per annum, for doing nothing. The House of Commons was appealed to in 1812, when the saving from my father's inventions was more than 30,000,000s. sterling; yet they refused to pay even the expense of my late brother's petition, though recommended by the committee, and not exceeding 350s. (See review in the *Journal of the Society of Arts*, July 27, and Aug. 3, 1855.) The House of Commons next year will be appealed to for saving, in 66 years, 309,000,000s. sterling. In the meantime, I addressed our illustrious Sovereign the Queen, praying that Her Majesty would be pleased to recommend my Ministers to grant me a small pension, being more than 70 years of age. Her Majesty was graciously pleased to command Col. Phipps to state, in reply, that I had reversed the case; for the Ministers should recommend to Her Majesty, and not Her Majesty recommend to her Ministers, proper objects for national rewards.

I addressed also His Royal Highness Prince Albert, President of the Society of Arts, who commanded Col. Phipps to state that His Royal Highness never interfered with State affairs. I then addressed the Lords of Her Majesty's Treasury, for some occupation under Government, when the Lordships replied immediately by regretting that it was not in their power to comply with my request; when I once more presumed to appeal to their Lordships to place me on the same list of pensions with my two sisters for 19s. per annum each; but, in reply, their Lordships again regretted that, after the decision of the House of Commons in 1812 (see review in the *Journal of the Society of Arts*, July 20, 27, and Aug. 3), they could do nothing; whereupon I reminded their Lordships that the Lords of the Treasury had, in 1816 (four years after that decision), granted to my two sisters pensions of 19s. per annum each.

I addressed also the secretary of the Society of Arts, who, with every desire on his own part to encourage my present efforts, was obliged to reply by stating that he had no power to aid me in the struggle I was making, beyond giving publicity to the case in the society's Journal.

I have since addressed the council of the Society, through the Chairman, the Rev. James Booth, LL.D., F.R.S., in the hope that they would bestow some honorary or pecuniary reward on my father's inventions having realised all the great objects for which the Society was established in 1781.

The following gentlemen have consented to act as an Honorary Committee in support of the appeal now made to Parliament:—The Rev. James Booth, LL.D., F.R.S.; Prof. Edward Solly, F.R.S.; Dr. W. B. Carpenter, F.R.S.; Charles Mauby, Esq., F.R.S.; Charles Hood, Esq., F.R.S.; W. Chapman, Esq., M.P.; David Mushet, Esq.; Charles Sanderson, Esq., Sheffield; H. E. Hoole, Esq., Sheffield; and others shortly will be named.

Lastly, I have addressed Mr. William Crawshaw, in the hope that he would become my leading patron in an appeal to the iron trade of Great Britain, the inventions of my father having added to the wealth of this powerful and influential body more than 20 millions sterling.

29, Bolitha-terrace, Barnsbury-park, Islington, Nov. 22.

P.S. Should this catch the eye of another of your occasional correspondents, under the signature of "Exposer of Abuses," he so perfectly guards the unsung age of the inventor of others, and so effectually blows out all axes of the latter description, that the category of honourable and equitable transactions between man and man, that he will favour me with his address, confidentially, I will forward all the facts and proofs touching the robbery and the ruin of the greatest benefactor to the iron industry, the wealth and commerce of the country.

## BRITISH IRON MANUFACTURE.—II. CORT'S INVENTIONS.

Sir,—I am gratified to see a response from two of your correspondents to Mr. R. Cort's most able statement, and poignant appeal, upon the greatness and the recompense of his father's merits. But I wish particularly to remark on Mr. Rogers's letter, containing a claim to the invention of the iron bottom for puddling furnaces. In the *Journal of the Society of Arts*, Mr. R. Cort, in July last, published a fearful narrative of the mode in which his father was ruined and plundered by those he had served, and his children subsequently deprived of their just claim on the public purse, by certain iniquitous proceedings before a Committee of the House of Commons, presided over by an eminent mathematician, Mr. Davies Giddy (afterwards Gilbert), M.P. for Bodmin. I have since written several letters in the same Journal, commenting on the dismal facts; and the matter is well worth the notice of those who take an interest in that problem of our nation, the treatment of their greatest benefactors by the Government and the capitalist, and by our Patent Laws. Rich men swell up their pride with the spoils of a fellow-being, just as they take the silk from a worm, or the wool from a sheep, and then kill them out of the way as an inconvenience. The Society of Arts has, under its title, a great and special mission, to take up and agitate claims for the redress of any infamous discouragement of arts, commerce, and manufactures; and I trust they will on this occasion exert an energy befitting their expressed objects, and the surpassing importance and urgency of the present occasion.

In one of these communications, I have referred to the use of iron bottoms, as the only important improvement added to the puddling process from the date when this great national boon, in 1784, sprung fully armed from the head of the inventor. In that reference I have named the Harfords, of Ebbw Vale, as the reputed inventors of iron bottoms. To my mind, nothing is more important than giving inventions to their rightful owners. "Accursed is he who removes his neighbour's landmark;" and feeling that the "flooding of a man's good name" is, if possible, more ignominious, I am always anxious strictly to examine and assign the true merit in such claims. I think it is very important that Mr. Rogers should make his title sure to a page in this history before it is too late. Mr. Matthew Wayne, I am sorry to hear, is going; but from Mr. W. Crawshaw himself Mr. Rogers could have no difficulty in obtaining a written declaration of the offer to him of the iron bottom in 1818. It would, also, be interesting to know how far Mr. Rogers had proceeded with his idea—if merely a suggestion, or whether he had made drawings of a plan, with any further particulars; if, for instance, the existing arrangement for keeping the bottoms cool. I was the more induced to name the Harfords as the probable inventors, because I had been told that, about 1813, Mr. Rogers, in your columns, claimed this invention, and my late father had replied, assigning it to Mr. Harford. No answer appearing, I concluded Mr. Rogers had either not appeared, or that he was far from the case.

Without at all detracting from the merits of Mr. Rogers, or of any other person, I can have no doubt that, had Mr. Henry Cort not been plundered and killed in the frightful manner revealed in a mass of private and public documents, of which there neither is nor can be any refutation, we should much earlier have had the iron bottom, even before the close of the last century. Mr. Cort, in his brief and outraged career, exhibited that logical sequence of invention which has distinguished all great discoveries of a new principle. Thus Watt, having grasped his new principle of condensation, followed it up by a series of co-operative developments (the parallel motion, for instance), to aid efficiency and completeness to the first idea. Similarly Cort, having invented and perfected the puddling by the flame of pit coal, proceeded logically to devise a means for disposing of the vast quantities of workable iron which this facility placed at command. He constructed the grooved, or fluted, roller, by which streams of solid iron, bars, rails, and every elongated shape, are spun out completely finished, by one single act of the pair of hands previously employed in turning and returning a hundred times the heated and reheated bloom under the forge hammer. We have the written testimony of Mr. Robert Thompson (uncle to the late Alderman Thompson), that Mr. Richard Crawshaw succeeded (difficult in manufacturing by the hammer, at Cyfarthfa, 10 tons of bar-iron weekly, of an inferior quality. Mr. Cort, having perfected his processes, Mr. Crawshaw, as well he might, appreciated their value, and engaged him to erect at Cyfarthfa his patent furnaces and rolls. Of the mill thus erected, Mr. James Cookshott, Mr. Crawshaw's partner, then residing on the spot, writes, in 1812, "that since that time (1785) it has been improved, though much limited." And Mr. Thompson continues, that this mill made 200 tons of iron weekly, of a quality fitted for anchors, and all those uses for which we hang upon foreign import, with the same labour, more ease than the 10 weekly and weekly tons had previously been elaborated. Mr. Samuel Hoare, at the same date, erected a similar mill at Pen-y-darwen, borrowing from Mr. Cookshott, as he relates, the drawings of the furnaces, the patterns of the rolls, and Mr. Cort's workmen. Thus came into use an invention which, though neither of these makers paid the royalty of 10s. per ton they contracted for, has created the iron trade, especially the export trade, of Great Britain, and annihilated the export trade of Russia,—an invention so great in its simplicity and its effects, that no inventor in any nation ever deserved so much the erection of a statue of gold to commemorate his achievement. Mr. Cort has but one compeer, Watt, who by his improvements in the steam-engine gave enormous blast to smelt the iron, and power to aid the mechanism to which Cort subjected it. Had the iron rolls been confined to positions, like Cyfarthfa, where a river is at command to drive the train, a great element of progress would have, of course, been wanting, though Dowdall and other works show that even Watt may be dispensed with. Without the steam engine the rolls might have done less, but without the rolls the steam engine could have done nothing; and if there were any ironmasters living who doubt or deny that the whole merit of the co-invention is due to Henry Cort, I here publicly call upon them to state who was the co-inventor, that his image may be placed at once beside that of Cort in the gallery of national worthies. If they name no such man, let them ever after hold their peace. Being myself entirely aware and convinced that Henry Cort was the sole inventor of the grooved or fluted roller, now in use all over the world in ironmaking, I was the logical supplement demanded by his invention of puddling. I can have little doubt that the iron bottom would have speedily suggested itself to his practical acumen, and further necessity, dictated by experience. In truth, I cannot doubt that many other improvements would have been devised by degrees, which now stand revealed, we are unable to conjecture how much the nation may have lost by the destruction of such a mind, the sacrifice of his life and interests to paltry avarice, mean jealousy, and the plague of official dereliction.—Nov. 20. DAVID MUSHET.

A NOVEL EXPERIMENT was successfully tried on board the *Horatio* screw steamer, while she was towing the *Glutton* floating battery out to the Mediterranean. In consequence of the condensation of one engine, the screw was stopped, and attempted to make the crippled engine still available, by working it on the non-condensing, or locomotive, principle. This was done by a temporary arrangement to carry the exhausted steam away on deck; and taking into consideration the roughness of the materials at hand for making such an alteration, and the urgency of proceeding without delay to get the *Glutton* out for the work in the Black Sea, the working of the engine on the non-condensing principle exceeded the most sanguine expectations of all on board.



# ON THE MERIDIONAL AND SYMMETRICAL STRUCTURE OF THE GLOBE—ITS SUPERFICIAL CHANGES, AND THE POLARITY OF ALL TERRESTRIAL OPERATIONS.—No. V.

[Read at the British Association meeting, Glasgow.]

BY EVAN HOPKINS, C.E., F.R.S.

**THE SEDIMENTARY ROCKS OF THE SOUTH TEMPERATE ZONE.**—The first thing that strikes the observer, in travelling over the plains and sedimentary terraces of Patagonia, and the extensive sandy desert of Australia, is that these dry lands are comparatively recent. The majority of the lagoons contain brackish water; the marine shells which are found scattered over the surface, if not identical, are at least so like those now existing in the bordering sea, as to be considered the same by all ordinary observers. The great siliceous trees of New Zealand, Van Diemen's Land, and Patagonia, are identical with the existing conifers of the south zone. The lands in the south frigid and temperate zones change their aspects almost suddenly, from the barren wastes of the antarctic, to the rich and gigantic foliage of the south temperate. There is no intermediate organic or vegetable band analogous to that which we see in the north: the change is abrupt from the frigid to a semi-tropical aspect.

The area of the sedimentary rocks of Australia, including Van Diemen's Land and New Zealand, is very limited, being confined to a few patches; the same also in Patagonia. The surface of the dry lands in general is only covered with sand, loam, and the debris of the exposed edges of the crystalline rocks already explained.

On referring to the entombed organic remains in the sedimentary beds, we find that the fern trees, Cycadeæ, Araucariæ, &c., are the characteristic fossil flora—i.e., the very same as the existing plants of that region. Attempts are frequently made, by theoretical geologists and their students, to separate the fossil species from those now flourishing in the same region; but those who are unbiased by any theory, and who are only guided by actual facts and direct observations, cannot distinguish the difference between the living specimens and the impressions and fossils enclosed in the beds. It is not easy to determine the species of living plants of an unexplored region from imperfect fragments. How slight is the clue, in many cases, afforded by a leaf; and how hopeless is the task when the botanist has before him only the fragments of a stem! Yet such are the materials from which, in nine cases out of ten, the describer of fossil remains constructs his extinct and new species.

We find, in Patagonia and Chili, the tops of the mountains covered with the shells of the neighbouring sea, and the fossil trees of the existing conifers: all appear comparatively recent, and belonging to the zone in which they are found.

**THE DEPOSITS OF THE TORRID ZONE.**—The portion most available for examination in this zone, with the exception of a part of India, is South America. In this region, we have the advantage of a very extensive and continuous series of sedimentary beds, which can be traced, more or less, from the south to the shores of the Caribbean Sea. The sedimentary rocks of equatorial America are intersected by very deep ravines, presenting every facility for making minute examinations. I beg reference to my large sections across the Andes for the details, and the contents of the beds.

On examining the series of bedding in the ascending order, we first find beds of clay and sand resting on the edges of the primary crystalline, much more consolidated and compact than those of the preceding zone, although containing the same kind of organic remains (but principally marine), indicating that they belonged to that zone. We next come to a series of sandstones, dark compact limestone, with seams of coal, and impressions of plants in the shale and clay, which plants are similar to the gigantic arborescent ferns and conifers of the south temperate, showing most distinctly that the beds correspond to such deposits as those now accumulating in the lagoons and great rivers of the south temperate zone. The upper beds of this formation predominate in sandstone, somewhat barren of organic remains; but, in the debris over the surface, and in the ravines, are found a great variety of ammonites, varying from 1 inch to 4 feet diameter, with oyster and other shells, fossil wood, and fossil bones of gigantic saurians and other animals.

When we take a general view of the physical conditions in which we find the above series of sedimentary rock, and which form such a large portion of the eastern branch of the Cordillera, for thousands of miles north and south, we cannot arrive at any other conclusion than that the deposits were formed in an inland sea; that the whole has been gradually, and somewhat uniformly, elevated to the present height; and that such continuity—unbroken beds for so many miles in extent—could not have been produced by volcanic eruptions, or any other convulsive force. Had geologists the opportunity of witnessing the constant mutations now going on along the coast of South America, by the slow and imperceptible elevations and subsidences, causing great geographical changes, they would have no reason to have recourse to their favourite theory of paroxysmal upheavals by internal fires.

On minutely examining the different sedimentary beds, we do not find the organic separations and the demarcations established by English geologists, in forming their favourite systems; on the contrary, we see a gradual transition from the lower to the upper beds in their organic contents. Hence, to produce such a series of deposits as we find (and admitting that the organic conditions of the respective zones have remained unaltered), it requires two movements—viz., a vertical one from the level of the sea, and a longitudinal one from the southern zone, to account for the apparent difference of the organic contents of the deposits below, as compared with those above. If we admit the vertical oscillation of the lands, there can be no reason why we should not also admit an horizontal or an oblique movement, especially when we find that it is as necessary to bring forward the organic remains of a bordering zone to the place where they are now found, as it is to raise the bed of the ocean to the top of the highest mountain, to account for such variable organic deposits, according to the existing laws in the economy of Nature.

It may be argued that the currents of the ocean from the south would be sufficient to account for the organic remains of the south being brought to the equator, and, therefore, that we required only the vertical oscillation to account for the changes. The oceanic movement from the south doubtless explains the origin of some deposits, as the drift, &c.; but those sedimentary deposits which indicate that the organic remains lived and died on the spot in which they are now entombed, and which have been gradually, and not violently deposited, or rather enclosed with mud and sand, require an action very different to that resulting from mere currents of water. The land, as well as the ocean, must also move en masse, although imperceptibly slow, as compared to the movements of the ocean, to account for the observed phenomena. In Malacca, Singapore, Borneo, Sumatra, Java, and Ceylon, the sedimentary rocks are but slightly developed; but, partial as they are, they exhibit the same kind of change—viz., the organic contents correspond with the marine and terrestrial fauna and flora of the southern hemisphere.

**THE SEDIMENTARY ROCKS OF THE NORTH TEMPERATE ZONE.**—This division embraces North America and Europe. On reference to the general view of the two hemispheres, it will be observed that the sedimentary series of rocks is more developed in this zone than in any other portion of the globe, more especially in Europe. The accompanying sections show at a glance their general character. Commencing our examination on the shores of the Pacific, we find the primary series only very partially covered by sedimentary rocks along the coast of California. To the north, in Vancouver's Island, there is a carboniferous formation, with impressions of plants analogous to those now flourishing in Chili. The primary rocks are more or less exposed from the Valley of the Sacramento to the east flank of the Sierra Nevada, and, as already stated, are traced on edge, running north and south for many hundreds of miles. The mountains of the Sierra Nevada, especially in Nappa, have numerous "volcanoes de agua." The apertures in the mountain sides frequently resemble the Geysers of Iceland, in the roaring and hissing of the vapour issuing from them. In some, the bubbling waters are so hot as to scald the hand; while, not far distant, springs discharge water almost as cold as ice. The process of the formation of limestone from calcareous springs can be seen going on daily in these regions, similar to those observed in operation in South America and Australia. A gentleman who had visited the above region writes:—"These fountains lay open at one view the extraordinary subterranean operations caused by chemical action, instead of the very crude and mistaken idea of volcanic fire, and the preposterous notions of an igneous globe. In one place, about 40 miles from the mountain, one of the party broke open a hard rock of shell limestone, and found in it a perfect shark's tooth, with serrated edges, precisely like the living species of the Pacific coast."

The fluviatile deposits of the Missouri and Mississippi contain land and

fresh-water shells of local species, with a considerable proportion of tropical productions. Proceeding eastward towards the Appalachian range, the carboniferous deposits are found developed in long, trough-like shapes, between the ridges of the primary series. The sedimentary deposits of the United States, Cape Breton, &c., contain upright stems of Calamites, Equiseta, Lepidodendrum, and a great variety of ferns, similar to those found still growing in Patagonia and the Brazils; and their fossil shows most distinctly that they grew on the very spots where they are now found entombed.

**THE SEDIMENTARY ROCKS OF EUROPE.**—These have been well examined by European geologists, and carefully divided into several systems of deposits. These groups are called the Cambrian, Silurian, Carboniferous, Oolitic, Cretaceous, &c., as described in the sections. In examining the organic remains, we find precisely the same indication of a change of climate from the south to the north as we find in other regions. The fossils are not simply drifted relics brought from the south by the currents of the ocean, but gigantic plants of the southern hemisphere, in a perfect state of preservation, with their roots still attached to the consolidated soil below, which may be seen in the coal formations of England, Bohemia, Saarbrück, &c., in the very position in which they grew and flourished, many of which cannot be distinguished from plants still growing in Australia and New Zealand.

Dr. Hooker's observations on this subject fully bear out the strong analogy between the organic aspect of the carboniferous series and the living representative in the southern hemisphere. Many geologists think it strange that the beds do not contain all the variety of organic remains we see now existing. It would be as unnatural to find cocoa-nut trees and bamboo mixed with the organic remains of the Silurian rocks, as it would be to see pine-apples and sugar-canes growing in the open air amongst the cabbages and potatoes in the northern region.

If, then, we name each system of sedimentary beds according to the zones in which it is herein assumed and maintained that the beds were originally deposited, we find all the apparent discordances and difficulties vanish, and the whole at once presenting a complete and consistent natural system of deposits. Let us take for example the following European series of sedimentary beds, from the Silurian to the Tertiary, and compare their contents with the deposits now accumulating in the respective zones:

Local names.	Zones where the beds were deposited.
1. Silurian	Antarctic Region.
2. Carboniferous	South temperate.
3. Oolitic	South temperate.
4. Cretaceous	South Tropic.
5. Tertiary	North Tropic.

On reference to each system of beds, it will be observed there is a perfect agreement between the organic aspect of the deposits and the existing state of things, and that a slow undulating movement of the surface of the earth, through different climates, in conformity with the polar force and movements, would produce the results observed. I have shown the action of terrestrial magnetism on the magnetic needles—in the structure of the crystalline rocks—and the perpetual movement of the ocean from south to north. I shall now conclude in showing how the whole surface of the earth is constantly moving from south to north, to cause the great changes I have described.

## UNITY JOINT-STOCK MUTUAL BANKING ASSOCIATION.

PRINCIPAL OFFICES—Unity-buildings, 8 and 10, Cannon-street, City.  
LEICESTER SQUARE BRANCH—1, New Coventry-street, Leicester-square.

### CLOSING OF THE SHARE LIST.

The Directors are happy to announce, that, in consequence of the large number of shares that have been allotted and paid upon, the SHARE LIST will be CLOSED on Friday, the 30th Nov., after which date no applications will be received. Arrangements have been made which will enable the bank to commence business early in January next.

This bank, to be incorporated by Royal Charter, is established for the purpose of founding the principle of MUTUAL BANKING, whereby customers, who create the profits, become entitled to a participation in them, by way of interest on their cash balances. The principle of mutuality has been for many years acted on by insurance companies, and their policy holders have participated to a very great extent in the bonuses, with much advantage to the institutions and the shareholders. By banks, however, to this period, mutuality has been neglected. The whole of the profits resulting from successful operations have been given to shareholders only.

### ADVANTAGES OFFERED BY THE UNITY BANK.

I. To shareholders, 5 per cent., from the date of payment, on all paid-up capital, as well as 50 per cent. of the profits.  
II. To customers, in addition to the ordinary amount paid on deposit and current accounts, interest on their cash balances, equivalent to 50 per cent. of the profits.  
This is the plan on which the Unity Joint-Stock Mutual Banking Association is established. By it is created, for the first time, an identification of interest between the customers and shareholders of the bank, who thus become mutually concerned in the extension of its business. It will be the means of opening up new business, preserving a connection once formed, and productive of practical benefits to the public generally.

### CONDITION OF LONDON JOINT-STOCK BANKS.

The success of joint-stock banks in London is readily admitted, as well as proved, by the statements periodically issued by those great commercial institutions. In support of this, the following table is submitted, showing the condition of each of the six metropolitan joint-stock banks which have published accounts, the original cost of the shares, their present market value, and the dividends payable thereon:—

Name of bank.	Date when established.	Paid-up capital.	Amount paid on each share.	Present value of each share.	Rate per cent. of dividend.
London and Westminster	1834	£1,000,000	£20	£47	10
London Joint-Stock	1836	600,000	10	32½	25
Union Bank of London	1839	422,135	20	39½	12
Commercial Bank of London	1840	300,000	20	31	10
Royal British Bank	1849	100,000	50	100	6

The above banks publish the following facts with regard to their positions:—  
I. The entire amount of subscribed capital in the six joint-stock banks in London is £2,104,200.  
II. The amount thereof paid-up is £2,817,035.  
III. The amount of deposits, or customers' balances, is £29,376,410.  
IV. The total number of shareholders is 4097.  
V. The number of shares issued, 187,084.

Thus is presented proof of known security, extent of business, and general financial resources. These establishments hold half-yearly meetings, and lay before their connections full accounts of their progress and general operations. This course cannot fail in inspiring with confidence all who have any dealings with them, while it gives to the public the means of forming an opinion as to their responsibility.

**INCREASED VALUE OF JOINT-STOCK BANK SHARES.**  
It is proved to demonstration, that joint-stock banking, under proper supervision, affords a most legitimate and unusually profitable field for the investment of capital. The dividends paid by the banks above-quoted vary from 6 to 25 per cent., and the latest quotations of their shares show an increase of from 55 to 225 per cent. on their paid-up capital. The real increase, however, in the value of the shares may be better understood by the fact that the paid-up capital of these six banks is £2,817,035, and that the present market value is £26,912,116. It has thus increased 2½-fold, so that every £1 has now become £23 10s., and there is every prospect of this amount continuing to increase in value.

### COURT OF DIRECTORS OF THE UNITY BANK.

J. J. MECHI, Esq., Tiptree Hall, Kelvedon, Essex—GOVERNOR.  
WILLIAM JOSEPH BRUCE, Esq., 16, Duke-street, Westminster; and 4A, Hyde-park-gate, Cumberland-gate.  
G. L. P. EYRE, Esq., (Messrs. Trinder and Eyre), 1, John-street, Bedford-row.  
THOMAS CARLILE HAYWARD, Esq., (Messrs. Hayward and Sons), 93, Minories; and 3, Highbury-park North.  
Major HENRY STONES, LL.B., 33, Nottingham-place, Regent's-park.  
ROBERT GARLAND, Esq., Thames Chambers, York-buildings, Adelphi; and Bel-fiore Lodge, Highbury.  
THOMAS H. BAYLIS, Esq., Cannon-street, City; and 4, Nottingham-terrace, York-gate, Regent's-park.  
Dr. LLOYD, 4, Suffolk-place, Pall Mall.  
ROBERT JAMES SNAPE, Esq., 2, Stone-buildings, Lincoln's Inn.  
EDWARD GOULD BRADLEY, Esq., Heathland Lodge, Hampstead.  
Major MARTIN MULKEN, Lightfield House, Alsop-terrace, Regent's-park.  
BANKERS—The London and Westminster Bank.  
SOLICITOR—Thomas Tayloe, Esq., 27A, Bucklersbury, London.  
BROKERS—Messrs. R. and J. Sutton, 22, Royal Exchange, London.  
GENERAL MANAGER—George Chambers, Esq., (from Messrs. Barnett, Hoare, and Co.)  
SECRETARY—Henry Lake, Esq.

Each of the directors is duly qualified, having subscribed for 20 shares, and paid the deposit of £1000, in accordance with the Deed of Settlement.

### THE NEW PRINCIPLE INTRODUCED BY THE UNITY BANK.

Regarding the distinctive principle of the Unity Bank, it has been suggested that there must be a detraction from the profits of the shareholders, by reason of 50 per cent. being given to the customers of the Bank. This idea can only have arisen, however, from the want of a careful consideration of the whole subject. In the first place, it is necessary to remember from whom the profits of a bank are derived. They are not made from the share capital. The very first ingredient for the formation of profits is a customer. The amount of profit must, therefore, be governed by the amount of business transacted; and the larger the business, provided it be properly conducted, the larger will be the profits. It must be borne in mind, also, that the real extent of the dividends must depend on the number of cents of profits, and that 100 per cent. derived from mere circumscribed business, may be far greater than 100 per cent. derived from more extensive business. If, then, the customers of a bank constitute its profits, the customers should be induced to transact their business with the bank, and thereby the profits of the shareholder, instead of being reduced, will be augmented. The inducement held out to the customer, however, should be such as does not involve or complicate the business of banking. It should not be by the

promise of some peculiar accommodation, or some particular and increased rate of interest, or by any departure from that sound system of joint-stock banking which has been the basis of the success of the Unity Bank, an advantage which interferes in no degree with established principles, but merely allocates a portion of that which has already been declared to be profit to those who have been the makers of it. Assurance companies have been accustomed to apportion certain of their profits, by way of bonus, to their assureds; and so general has become the recognition of the right of the assured to this participation, that no assurance association would now be established without this essential to success. The justice of the principle consists in this—that as the assured makes the profits of the company, they ought to be participants in its prosperity. What is just in assurance is just in banking. The customers of a bank make the profits of the bank, and they ought also to be participants in its prosperity.

It has been asserted, also, that the 50 per cent. of the profits proposed to be divided, while it would detract from the profits of the shareholders, would be but a trifling benefit to the customers. It might, in the first place, be replied that no benefit is considered "trifling" by those who rightly estimate pecuniary affairs; that the benefit, if trifling, is in addition to all the other benefits actually derived by banking at a joint-stock bank, and that no correct data can yet be formed of the profits that will be made. On the other hand, it must be remembered that hitherto persons have taken their banking account where personal feeling, accommodation, or convenience of locality might lead them. Now, for the first time, by the introduction of the principle of mutuality self-interest is appealed to. And when to the large number of the public attracted by this all-powerful stimulus is added the number of the connections without this essential to success, it may fairly be stated that antecedent data are not sufficient to form an estimate of the advantages which both the shareholders and customers will derive from the Unity Bank.

Great difficulty exists in estimating the effects likely to be produced by the establishment of this new and most desirable feature in banking. It is one that must become highly popular with every commercial interest, and with every class of the public, because its simplicity and advantages are at once seen and appreciated.

To those great commercial bodies who are compelled to have large cash balances constantly at their bankers', it will prove to be a serious consideration, and a most important source of profit. The railway, dock, gas, water, steam navigation, insurance, and other companies, professional men, merchants, brokers, gentlemen of fortune, and traders of all kinds, will duly estimate the difference in the system now proposed, from that heretofore existing. In fine, as joint-stock banks become a public necessity, as is now proved, so will the principle of mutuality—whereby these admirable institutions may be rendered still more serviceable to the public, and in no way less safe—demand the best consideration of the community at large.

### BUSINESS TO BE UNDERTAKEN.

All the usual business of banking will be undertaken; and arrangements will be made for extending the transactions of the bank in every desirable quarter. CURRENT ACCOUNTS will be made up half-yearly—namely, to June 30 and Dec. 31, and interest will be allowed at the rate of 4½ per cent. on them.

DEPOSIT ACCOUNTS.—With respect to these, the rate of interest allowed on money placed at seven days' notice will be £1 per cent. under the rate of discount on money class bills adopted by the Bank of England, regulated thereby. The bank will give receipts for the sums so deposited, or, for the convenience of depositors leaving England, promissory notes, or bills, including interest as well as principal, at not less than six months' date.

The bank will undertake the agency of country and foreign banks, whether joint-stock or private, and will accord every accommodation to travellers and others, with respect to circular notes and letters of credit. It will receive all kinds of income for its customers, including annuities, dividends, military, naval, and civil officers' pay. It will undertake the sale and transfer of stock in the public funds, &c.; and will be responsible for the safe custody of title deeds and other securities belonging to its customers, to which they will at all times have convenience of access.

Applications for prospectuses and forms of application for the remaining shares to be made to Messrs. R. and J. Sutton, stock-brokers, 22, Royal Exchange; or to the Secretary, at the principal offices, 10, Cannon-street, City.

### FORM OF APPLICATION FOR SHARES.

To the Directors of the Unity Joint-Stock Mutual Banking Association.  
GENTLEMEN,—I request that you will allot me shares of £100 each in the above association; and in consideration of such allotment, or any less number you may appropriate to me, I hereby undertake to pay the deposit, or first call of £10 per share, thereon, and £40 at the time of incorporation. I further undertake to execute the Deed of Settlement when required.  
Dated this day of , 185 .  
Reference  
Names in full  
Residence  
Profession or trade  
Place of business

## UNITY JOINT-STOCK MUTUAL BANKING ASSOCIATION.

PRINCIPAL OFFICES—Unity-buildings, 8 and 10, Cannon-street, City.  
CLOSING OF THE SHARE LIST.  
Notice is hereby given, that NO FURTHER APPLICATIONS FOR SHARES in this BANK will be RECEIVED after Friday, the 30th November.  
Unity-buildings, Nov. 9, 1855. By order, HENRY LAKE, Sec.

## BANKING AND GUARANTEE BUSINESS COMBINED.

THE MERCANTILE GUARANTEE AND ASSURANCE COMPANY (Registered Provisionally), in union with, and to supersede, the Solvency Mutual Guarantee Company, Incorporated for the Guarantee of Debts, Bills, Notes, Bonds, and other Monetary Risks; and also for Banking in combination with Debt Guarantee, whereby commercial transactions will be greatly facilitated.

LONDON ..... 23, KING WILLIAM STREET, LONDON BRIDGE.  
MANCHESTER ..... 23, BROWN STREET.  
LIVERPOOL ..... 35, OLD HALL STREET.

Capital £250,000, in shares of £5 each.—Deposit 10s. per share.  
No calls are contemplated, but the holders of shares may pay up, at any time, the whole or any part of such shares. The liability of shareholders limited to the amount of their shares.

This company is not to be regarded as a new institution, but simply as an extension and reconstruction, on the proprietary system, of the Solvency Mutual Guarantee Company, which, since its complete registration in 1852, has, even with the limited powers afforded by the purely mutual constitution, and in the face of many and vast difficulties, achieved a position and attained an amount of business which it is confidently asserted have never been equalled by any institution within the same time. This success, it is believed, will be greatly augmented and consolidated by a further development of its powers.

The plan, as now extended, offers to shareholders a safe and (especially by means of the discount branch) lucrative investment, besides reserving to them one-third of the profits arising from the guarantee business of the company. The remaining two-thirds of these profits to be divided among the assured members, who, in addition to the advantages conferred by their guarantees, will derive legitimate and most valuable assistance through the discount and reference, and debt recovery departments.

The business of the company, which, by the deed of constitution, may be greatly extended, comprises chiefly—

**THE DEBT GUARANTEE DEPARTMENT.**  
The application of the principle of assurance to this purpose is based upon accurately compiled tables, by which it is demonstrated that, among the immense number of merchants, bankers, manufacturers, and traders of Great Britain, there is in each occupation, within equal periods, a determinate average amount of insolvency.

**THE BANKING AND DISCOUNT DEPARTMENT.**  
The objects of this department are, by discounting trade bills covered by guarantees issued by the company, to afford to the shareholders a safe profit, and to the assured the advantages of a "discount account" in union with a guarantee on their gross annual sales.

The system adopted will, when fully developed, differ in no material respect from the usual business of the joint-stock banks.

Persons, therefore, who seek for a permanent or temporary investment of their surplus capital at the highest rate of interest compatible with safety, will find in this branch of the company's operations a means certainly not less safe and remunerative than any afforded by the joint-stock and private banks.

Applications for shares, prospectuses, agencies, &c., to be made at the chief offices of the company, 38, King William-street, City.

CHARLES STUART CANSDELL, Managing Director.

### FORM OF APPLICATION FOR SHARES.

To the Directors of the Mercantile Guarantee and Assurance Company.  
GENTLEMEN,—I request that you will allot me shares of £5 each in the above company; and in consideration of such allotment, or any less number you may appropriate to me, I hereby undertake to pay the sum of per share thereon, and to execute the Deed of Settlement when required.  
Dated this day of , 185 .  
Signature  
Residence  
Profession or trade  
Place of business

## STEAM-ENGINES.—MINING, PUMPING, WINDING, and

other STEAM-ENGINES, with and without wheels, FOR SALE, or TO BE LET ON HIRE, by the month, or for any time required.

MEDWIN'S PATENT PORTABLE PUMPING, WINDING, and other STEAM-ENGINES, with and without reversing gear, pumps, &c., adapted to mining, and applicable to every other purpose where steam-power is required. May be set to work without fixing brickwork or chimney shaft; have been successfully employed for upwards of six years in mining, at home and in the Colonies, and for contractors' works auxiliaries in extensive mills and manufactories generally.

The patentee has a very large stock of these engines ready for immediate delivery, either to be let on hire, or for sale,—of 4, 6, 8, 10, 12, 16, 20, 40-horse power, and upwards, which will be delivered carriage free.

For particulars and terms, apply to MESSRS. MEDWIN and HALL, engineers, Surrey Ironworks, 92, Blackfriars-road, London.

LONDON: Printed by RICHARD MIDDLETON, and published by HENRY ENGLISH (the proprietors), at their offices, No. 26, FLEET-STREET, where all communications are requested to be addressed. [November 24, 1855.]

